Research Article

Systemic inflammation and metabolic syndrome among patients with chronic obstructive pulmonary disease

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Introduction
Chronic obstructive pulmonary disease (COPD) is characterized by progressive and irreversible airflow limitation, impaired quality of life and increased mortality. It is the fourth-leading cause of chronic morbidity and mortality worldwide[1]. There is accumulating evidence that COPD has many extrapulmonary effects thought to be related to systemic inflammation. Clinical severity of the disease is determined not only by spirometry but also by concomitant comorbidities[2]. The previous studies showed that markers of systemic inflammation like high-sensitivity C-reactive protein (hs-CRP), interleukin (IL)-6 were higher in blood of COPD patients than the ones without COPD[3].Metabolic syndrome (MetS) is characterized by a group of risk factors (abdominal obesity, atherogenic dyslipidemia, raised blood pressure, insulin resistance) that increases the development of several diseases such as coronary artery disease, diabetes mellitus[4]. It has been shown that 50% of patients with COPD had one or more components of the MetS[5].

Key Words: COPD, systemic inflammation, MetS

Aim of work
1- Determine the frequency of metabolic syndrome in stable patients of COPD.
2- Detect the correlation of both of metabolic syndrome criteria and serum level of hs-CRP with pulmonary function tests among patients of COPD.

Patients and methods
This study was performed on 70 patients with stable COPD who were presented as a follow up visit to chest clinic at Minia University hospital in the period from October 2015 to October 2016.The study also included 20 apperantly healthy controls matched in sex and age with COPD patients. All the patients and healthy controls had been subjected to the following: Detailed medical history taking included (age, sex, smoking status, duration of illness and symptoms). General examination: included body weight and height were measured and the body mass index (BMI) was calculated, Blood pressure and waist circumference were also measured .Local chest examination: which showed signs of airflow limitation. Investigation included: Plain chest x–ray (PA view). Fasting blood glucose (FBG) and lipid profile in the form of plasma triglycerides (TG), high density lipoproteins-cholesterol (HDL-c) after 12 h. fasting, pulmonary function tests (PFT).

Blood samples were collected for measurement of high sensitivity C- reactive protein (hs-CRP). According to the National Cholesterol Education Program–Adult Treatment Panel (NCEP–ATP III) report[6], the diagnosis of the metabolic syndrome requires three or more of the 5 following criteria: 1-waist circumference ≥ 102 cm and ≥ 88 cm for men and women, respectively.
2- fasting triglycerides ≥ 150 mg/dL.
3- High density lipoprotein-cholesterol (HDL-C) < 40 mg/dL for men and < 50 mg/dL for women.
4- blood pressure $\geq 130/85$ mmHg.
5- fasting plasma glucose ≥ 110 mg/dL .

Results
Table (1): Demographic data of the studied patients and controls

Variable		COPD cases N=70	Controls N=20	P
Age	Range	44-83	40-70	0.07
	Mean ±SD	60.9±7.5	55.05±7.8	
Gender	Male	64(91.4%)	16(80%)	0.1
	Female	6(8.6%)	4(20%)	
Smoking	Current smoker	19(27.1%)	3(15%)	0.001*
	Ex smoker	38(54.3%)	2(10%)	
	Non smoker	13(18.6%)	15(75%)	
Pack / year	Range	2-50	3-20	0.005*
	Mean ±SD	22.8±9.1	10.6±7.02	
BMI	Range	18.6-40	22.4-36	0.9
	Mean ±SD	29.07±5.1	29±4.1	
mMRC	Range	1-3	-	-

Table (2): Criteria of metabolic syndrome among COPD cases and controls

Variable	COPD cases N=70	Controls N=20	P
1. Waist circumference ≥ 102cm for male and ≥88cm for female	55(78.6%)	10(50%)	0.007*
2. BP≥130/85	2(2.9%)	0(0%)	0.2
3. TG >150	22(31.4%)	0(0%)	0.001*
4. HDL < 40 for male and <50 for female	24(34.3%)	20(100%)	0.002*
5. FBG ≥ 110	43(61.4%)	0(0%)	0.007*

Table (3): Correlation between pulmonary function tests and hs-CRP among COPD patients

Data	FVC%		FEV1%		FEV1/FVC		FEF25-75%		PEER	
	r	P	r	p	r	P	r	p	r	P
hs-CRP	0.004	0.9	0.02	0.8	-0.07	0.5	-0.04	0.7	-0.006	0.9

Figure (1): Correlation between FVC% and TG among patients with metabolic syndrome.
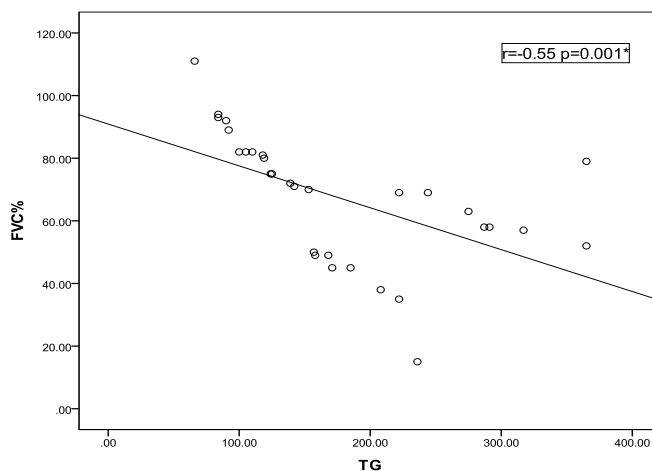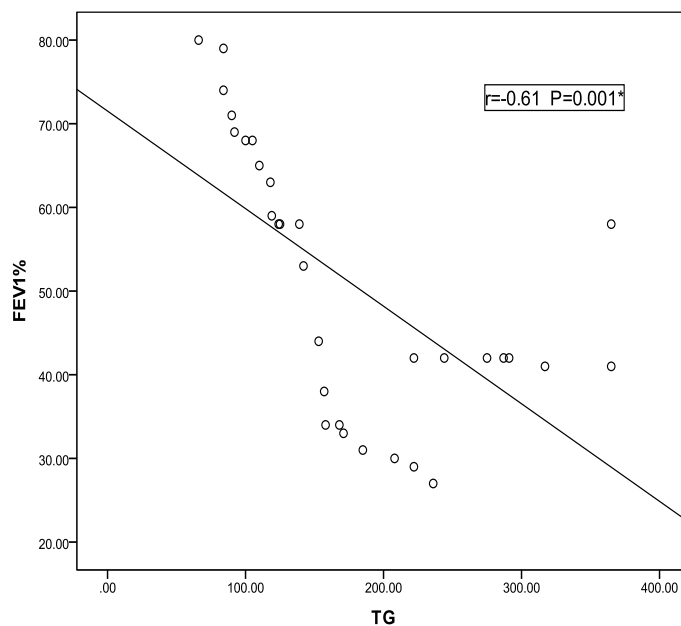

Figure (2): Correlation between FEV1% and TG among patients with metabolic syndrome

Discussion

We assessed the prevalence of metabolic syndrome in stable COPD patients, and we found that 31 patients had MetS based on ATP III definition and this number was significantly higher than control group as none of the controls had MetS .Several studies from different parts of the world have shown a prevalence of MetS among COPD patients of[7,8]. We found also higher serum triglycerides in patients than controls higher serum high density lipoprotein cholesterol among patients than controls and fasting blood glucose were

significantly higher in COPD patients versus controls .On the other hand no significant difference in blood pressure between patients and controls was found. Ameen et al.,(9) found a significant higher difference among COPD patients than controls as regard fasting blood sugar and serum triglyceride with no significant difference in waist circumference and blood pressure. Karine et al.,[10] and Hoseny et al.,[11] found also elevated HDL-C in COPD patients when compared with the control group with statistically significant differences.

Regarding correlation of pulmonary function parameters and MetS criteria in COPD patients, we found a significant inverse correlation of triglyceride only with FVC% and FEV1%. Ameen et al.,[9] showed significant inverse (negative) relation between severity of COPD (FEV1) and all parameters of metabolic syndrome except HDL which showed linear (positive) relation with FEV1. Popović-Grle et al.,[12] found that FVC and FEV 1 correlated negatively with WC; however, the correlation was weak and statistically non significant and this is in line with our results of FEV1 and FVC correlations with waist circumference. The origin of systemic inflammation in COPD is not completely clear. The hypothesis that systemic inflammation is originated by spill over from the pulmonary compartment has not yet been proven[13]. It has been suggested that some common genetic or constitutional factors may predispose individuals with COPD towards both systemic and pulmonary inflame-mation[14]. We found that mean value of serum hs-CRP was significantly higher in COPD patients than controls and it was also significantly higher in COPD patients with MetS versus those without MetS .Our results were in accordance with that of Stanciu et al.,[15], Akpinar et al.,[16] and Watz et al.,[7] results.Considering the corre-lation of hs –CRP and lung function indices (Table 9), we found no significant corre-lation between them. Some researchers showed a significant negative correlation between hs-CRP level and FEV1[17,18]. In accordance with our findings, Ghobadi et al.,[19] found the correlation of hs-CRP with FEV1 was not significant. They attributed this to that serum hs-CRP does not adequately reflect all the pulmonary and extra-pulmonary manifestations of disease.

Conclusion

According to ATP III definition, 31 patients out of 70 patients had metabolic syndrome so the prevalence of metabolic syndrome in this study was 44.3%. Most of the patients with metabolic syndrome were in 51-60 years. BMI (body mass index), DBP (diastolic blood pressure), TG (triglycerides) and FBG (fasting blood glucose) in COPD patients with metabolic syndrome were higher than in COPD patients without metabolic syndrome. Most of COPD patients with metabolic syndrome are found in grade 2 and 3. There was no significant difference as regad age ,gender ,duration of illness, smoking, Lung function impairment didn't differ between COPD patients with and those without metabolic syndrome.Serum levels of hs-CRP was higher in COPD patients than controls and also was significantly higher in COPD patients with metabolic syndrome than those without metabolic syndrome. Negative correlation of FVC%, FEV1 and TG was found among COPD patients with metabolic syndrome. No correlation between hs-CRP and PFTs. When the components of metabolic syndrome were evaluated separetely, abdominal obesity and impaired glucose and DM were more frequent in patients with COPD.

Recommendations

We recommend that daily moderate intensity activity for most days of the week for patients with COPD as 78.6% of COPD patients had high waist circumference. Decreasing body weight can significantly educe TG and increases HDL-C.

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